REMARKS

1. Restriction Requirement

In the Final Office Action mailed May 5, 2004, the Restriction Requirement was made final in part because "Applicants have not identified which claims are supposedly linking claims or reasons supporting why the claims qualif[y] as linking claims" (Final Office Action, p. 2). Applicants note that Claims 14, 17, 19, and 22 were identified as linking claims in the response filed February 13, 2004 with the following remarks:

> In the present case, Claim 14 defines an apparatus for performing the steps of the method recited in Claim 6, and Claim 17 defines an apparatus for performing the steps of the method recited in Claim 1. As such, they are both linking claims and it is improper to restrict them from Group I. Similarly, Claim 19 defines a substrate processing system that includes elements for performing the steps of the method recited in Claim [13] [1], and Claim 22 defines a substrate processing system that includes elements for performing the steps of the method recited in Claim 1. In addition, Applicants respectfully contend that should the linking claims be deemed allowable, then the restriction requirement would be improper and the requirement restricting the claims of the three Groups would need to be withdrawn (See MPEP 818.03(d)). Since each of the apparatus claims in Groups II and III is thus linked with the method claims of Group I, the claims of Groups II and III would not be divisible from those of Group I were the linking claims found to be allowable. (Response to Office Action mailed February 13, 2004, pp. 9 – 10).

In particular, each of Claims 14, 17, 19, and 22 recites a computer-readable storage medium embodied therein for directing operation of a substrate processing system with instructions to perform the identical steps recited in one of the method claims. The Restriction Requirement is therefore also inconsistent with MPEP §806.05(e) in light of the PTO's Examination Guidelines for Computer-Related Inventions as set forth in MPEP 2106 (*see* Response to Office Action mailed February 13, 2004, pp. 8 – 9).

Since the specific identification of the linking claims and the reasons why they qualify as linking claims appears not to have been considered, Applicants request that the finality of the Restriction Requirement be withdrawn and the reasons for traversal reconsidered.

Applicants further believe that traversal of the Restriction Requirement was timely. If the Restriction Requirement is maintained, Applicants request an acknowledgment of

[1] Applicants regret the previously erroneous citation of Claim 6 rather than the correct citation of Claim 13.

the timeliness of the traversal and an indication that the right to petition from the requirement under 37 CFR §1.144 has been maintained. *See* MPEP §821.01.

2. Claim Rejections

Claim 6 stands rejected under the first and second paragraphs of 35 U.S.C. §112; Claims 1, 2, 4, and 5 stand rejected under 35 U.S.C. §102(b) as anticipated by U.S. Pat. No. 5,252,178 ("Moslehi"); Claims 1, 2, 4, and 5 stand rejected under 35 U.S.C. §102(e) as anticipated by U.S. Pat. Publ. No. 2001/0028922 ("Sandhu"); Claim 3 stands rejected under 35 U.S.C. §103(a) as unpatentable over Moslehi or Sandhu in view of U.S. Pat. No. 6,167,834 ("Wang"); Claims 6 – 10, 12, and 13 stand rejected under 35 U.S.C. §103(a) as unpatentable over Sandhu in view of U.S. Pat. No. 5,061,838 ("Lane"); Claim 11 stands rejected under 35 U.S.C. §103(a) as unpatentable over Sandhu in view of Lane and further in view of U.S. Pat. No. 5,891,349 ("Tobe"); and Claims 6 – 13 stand rejected under 35 U.S.C. §103(a) as unpatentable over U.S. Pat. No. 5,920,792 ("Lin") in view of U.S. Pat. No. 5,061,838 ("Lane").

a. §112 Rejections of Claim 6

The §112 rejections of Claim 6 are respectfully traversed. The application explicitly discloses bottom plate 60 in Fig. 1 as separating the plasma from the plasma coupling structure, so that the limitation is both described and enabled by the specification. Applicants draw the Examiner's attention, for example, to the following description at p. 14, ll. 13 – 15 of the application:

> The plasma includes poloidal ion flow along field lines substantially parallel to a surface, such as bottom plate 60, that separates the plasma from the coupling structure.
> (Application, p. 14, ll. 13 – 15).

It is further believed that this language is consistent with similar descriptions of the role of the separating surface at p. 4, ll., 10 – 13, p. 6, ll. 17 – 19[2], and p. 7, ll. 28 –30. It is, moreover, not

[2] This language is cited in the Office Action, but is respectfully believed to have been parsed incorrectly. In the sentence "The toroidal configuration produces field lines predominantly parallel to, rather than perpendicular to, the interior chamber surfaces separating the coupling structure from the plasma," there is no comma between "surfaces"

understood physically how the field lines can be viewed as separating the plasma from anything since it is along the field lines that ions of the plasma flow.

b. Prior-Art Rejections of Claims 1 – 5

Independent Claim 1 has been amended to clarify certain claimed aspects of the invention. Reference to the substrate has been amended to refer to a "substrate wafer" (Application, p. 6, l. 8), thereby foreclosing the interpretation presented in the Office Action that "the chamber walls ... read[] on applicants' substrate" (Office Action, p. 12). The substrate wafer is distinct from the process chamber.

In addition, Claim 1 has been amended to clarify that the plasma source is a toroidal plasma source having a core and a coil and is disposed within the process chamber (*see, e.g., id.*, Fig. 1 and p. 8, ll. 15 – 16). Such a configuration is not taught or suggested by either Moslehi or Sandhu. The plasma source described in Moslehi is clearly not a toroidal plasma source. The plasma source described in Sandhu clearly does not include components within the process chamber, as is evident from Fig. 1 of Sandhu.

Claim 1 has also been amended to recite that the flow of the etchant gas provides a net etching back of the part of the first portion of the film (Application, Figs. 3C and 3D, p. 16, ll. 3 – 10). This clarification is not believed to narrow the original language of the claim. Neither Moslehi nor Sandhu discloses a net etching back of part of the first portion of the film. In this context, Applicants again respectfully disagree with the Office Action's characterization of the cleaning cycles described in Moslehi as being used to etch a film deposited on a substrate, particularly in view of the clarification that the substrate is separate from the process chamber. It is well known in the semiconductor processing art that chamber cleaning is periodically needed, but such cleaning is not performed while wafers are actually in the chamber. The need to remove material from all surfaces within the process chamber means that the cleaning cycle is not performed with the same careful control as etching processes, which are used in the fabrication of very precisely manufactured device structures.

Moslehi itself draws a distinction between etching processes and cleaning processes, thereby belying the assertion in the Office Action that they are the same. For

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and "separating"; accordingly, the clause "separating the coupling structure from the plasma must modify "the interior chamber surfaces," not "field lines."

example, Moslehi makes such remarks as "the present invention permits in-situ chamber cleaning *intermittent with* the plasma *etch* or deposition processes" (Moslehi, Col. 3, ll. 19 – 20, emphasis added) and "when the plasma deposition or *etch* gases flow into the process chamber, the in-situ plasma *cleaning* gas flows will not occur, and vice versa" (*id.*, Col. 2, ll. 61 – 63). There are numerous other similar distinctions made between etch processes and cleaning processes in Moslehi. In supporting its view that the cleaning may be performed while a wafer is present in the chamber, the Office Action cites the following (Office Action, p. 12):

> To achieve these results, effective in-situ chamber cleaning during or after a deposition or etch process is particularly attractive. The preferred embodiment accommodates these types of effective in-situ cleaning processes as well as improved plasma processing capabilities. (Moslehi, Col. 4, ll. 50 – 55).

It is respectfully believed that the Office Action's conclusion that this language teaches performing deposition and cleaning at the same time is incorrect. The passage refers to a deposition or etch *process*, which may include a number of distinct steps. Reference to cleaning "during" such a process merely means that the chamber may be cleaned between some of the steps that form part of the process, not that the chamber be cleaned while the precise deposition steps themselves are being performed. This is reinforced with every example disclosed in Moslehi, none of which discloses cleaning the chamber while material is being deposited on a wafer.

As noted in the previous response, Sandhu also fails to disclose a net etching back of part of the first portion in the film. Instead, Sandhu describes a process that makes use of *simultaneous* deposition and etching components to provide a net deposition, as is well known in the art for such processes as HDP-CVD. The variations in process conditions described in Sandhu may result in variation of conformality by controlling relative deposition and etching contributions (*see, e.g.*, Sandhu, Figs. 2a – 2b, ¶¶41 – 42), but there is no separately delineated etching phase in that sequence where there is a net etching back of a first portion of a film as the claims require.

c. Prior-Art Rejections of Claims 6 – 13

As noted above in the context of the §112 rejection, a limitation of Claim 6 was not correctly interpreted when Claims 6 – 13 were examined. The application teaches, and

Claim 6 requires, that poloidal ion flow of the plasma be included along field lines substantially parallel to a surface interior to the process chamber, the surface disposed to separate the plasma from the plasma coupling structure. Such a feature is neither taught nor suggested in the cited art. This is self-evident from Fig. 1 of Sandhu and Fig. 1 of Lane. There is also no teaching or suggestion of such a feature in Lin, which is acknowledged by the Office Action as being silent on the issue (Office Action, p. 10).

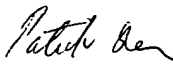
Claim 6 has been amended for purposes of clarification along the same lines as was done for Claim 1. In particular, the substrate is now recited as a substrate wafer disposed within the process chamber, and the plasma coupling structure is recited as a toroidal plasma coupling structure disposed within the process chamber and comprising a core and a coil. While the Office Action asserts that Lane teaches inner coil 12 as being disposed within the interior of reactor 100, this is not apparent from Fig. 1 of Lane, which appears to show inner coil 12 as being disposed outside of the baffle region 60 of the chamber. The Examiner's attention is drawn to Fig. 4 of Lane, showing a cutaway perspective view of the chamber. This view clearly shows the chamber with a shape that would accommodate the inner ring 12 being positioned only *outside* the chamber.

CONCLUSION

In view of the foregoing, Applicants believe all claims now pending in this Application are in condition for allowance. The issuance of a formal Notice of Allowance at an early date is respectfully requested.

If the Examiner believes a telephone conference would expedite prosecution of this application, please telephone the undersigned at 303-571-4000.

Respectfully submitted,



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